Table 7
Ecological Risk Assessment Data Needs

Data Need	Justification	Data use	Potential Methologies	Comments
1. Tissue concentrations from infaunal invertebrates (living in soft sediment, being large enough to displace sedimentary grains) and epibenthic invertebrates (may be freely moving on sediment surface permanently attached to a surface or structure)	Multiplate samples may not represent the biomass or diversity of the invertebrates consumed by other receptors, and therefore may bias or increase uncertainty in the Food Web Model and Dietary Approach. Studies indicate that crayfish may not be good accumulators of contaminants, and therefore may not represent other epibenthic species. Additional data on invertebrates are needed to better represent site-specific exposure.	Tissue concentrations will be used for contaminant pathway analyses in the Food Web Model and Dietary Approach, for endpoint analyses for epibenthic invertebrates themselves, and could improve estimates of site-specific exposure.	Laboratory and or in-situ bioaccumulation testing	This data need is contingent on whether adequate data are obtained on clams and *Lumbriculus* in the late-2005/early-2006 sampling effort and proposed Lumbriculus and *Corbicula* lab tests.
2. Tissue concentrations for invertebrates exposed to surface water	These data are needed to represent surface water exposure to invertebrates, both on structures and in the water column.	Will be used in the Food Web Model and Dietary Approach.	Deploy more multiplates than in Round 2 over a larger area; zooplankton tows	Review existing multiplate data when analysis is complete to inform subsequent sampling (sufficient tissue was not obtained in the first sampling effort to represent individual sites or faunal diversity). Zooplankton tows are also needed with the ability to separate zooplankton from phytoplankton or detritus.
3. Collect periphyton and phytoplankton (in-water plants) for tissue contaminant analysis.	These data are needed to provide dietary concentration information for receptors of concern and for use in the Food Web Model.	Will be used in the Food Web Model and Dietary Approach.	Net and tow collection, potentially other methods available	Should be combined with zooplankton collection. Identify to appropriate level of taxonomic level. Contingent on evaluation of multi-plate and benthic tissue sampling results
4. Biota tissue to develop localized estimates of exposure for source identification, assessing localized risk and developing BSAFs.	Composite sampling of wider ranging species, and/or combining samples from diverse locations within the same composite does not provide sufficient spatial resolution for site specific evaluation.	Will be used in site specific ERAs, in the Food Web Model and Dietary Approach, and for source identification.	Caged and field collected clams, mussels, sculpin, possibly crayfish (crayfish accumulation is variable, but they are an important pathway for fish and birds), Semi-permeable membrane devices (SPMDs), bioaccumulation testing	

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5. Need to collect clams and larger, longer-lived mussels, and need to identify the species of mussels found in the ISA	These data are needed to better characterize dietary uptake for invertivores (larger mussels for mink, otter and sturgeon) and to develop BSAFs, especially at site specific locations. Existing sample size of clams (n = 3) is inadequate	Will be used in the Food Web Model, to assess risk to invertivores and shellfish, and to derive BSAFs.	Co-located benthic sledge tows and sediment grabs	Fall 2005 benthic tissue sampling is expected to fill this data gap.
6. Colocated samples for sculpin and sediment	Additional sculpin tissue is needed to assess exposure to transition zone water, evaluate temporal (seasonal and interannual) variability, and assess localized risk at certain sites. In addition, adequate spatial coverage does not exist for wildlife feeding areas in relation to sediment areas of concern	Will use in the Food Web Model, in the Dietary Approach for wildlife receptors, for source identification, to establish a more reliable BSAF, and as part of a strategy to monitor temporal trends in contaminant levels	Need to stratify sampling across a range of contaminant levels to further the develop relationship between sediment and sculpin concentrations.	See Data Gaps 4 and 5 above.
7. Additional lines needed to assess PAH exposure and risk to all fish	Most PAHs are metabolized in fish, and for those that are not metabolized, TRVs are not available to assess (and the detection limits previously used were not adequate to detect PAHs in tissue). Concentrations in fish prey items may not represent what the fish is actually exposed to, resulting in high uncertainty in using the Dietary Approach	Will use additional lines of evidence to evaluate resident fish exposure to PAHs, understand relationship between concentrations in sediment and water, and identify deleterious effects.	Additional lines of evidence include analysis of stomach contents for unmetabolized PAHs and evaluation of liver and skin lesions.	Analysis needs to be conducted on individual fish, and could be coordinated with fish lesion data collection and/or data collection to understand variability in individual fish concentrations (see below)
8. Quantify fish liver and skin lesions	Need to understand relationship between sediment concentration and incidence of occurance of liver or skin lesions in fish.	Will use as a line of evidence risk associated with PAH exposure.	Conduct a fish health assessment on individual fish.	Existing information was collected incorrectly or not at all. Data collection should be combined with other sampling efforts on individual fish
9. Need to understand variability in individual fish concentrations	Existing composite samples are valuable for assessing contaminant transfer to upper trophic species, but composites provide limited information for assessing risk to individual fish themselves. Population and individual risk may be misrepresented by looking at mean composite versus individual concentrations.	Will use to reduce uncertainty in the Food Web Model and to better represent risk to fish populations and individuals of special status species. May also address some human health data needs.	Collect specific individual fish species (northern pikeminnow, smallmouth bass, black crappie, largescale sucker and sculpin) for chemcial analysis.	Individual fish sampling will support PAH lines of evidence and fish health assessment data needs.
10. Need to better characterize the range of variability in the ISA system	No data currently exists to understand how tissue or water contaminant concentrations change during different times of year. Contaminant concentrations likely vary greatly from summer to winter months. For example, data shows that periods of high flow can increase sediment resuspension and bioavailability, and may increase storm water discharges and bioaccumulatives in the river	Will use to refine and improve the Food Web Model and to assess risk over time	Caged clams or mussels, SPMDs, surface water collection, sculpin samples	Seasonal surface water data and BCFs could work to predict seasonal changes in tissue concentrations, but tissue data would provide better representatin.

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11. Site-specific data on potential risk to early life stages for fish	Need site specific concentrations in early life stages such as in eggs and developing embryos.	Assess reproductive effects of contaminant levels for which egg TRVs are available; compare to egg TRVs.	Collect resident fish eggs for analysis, or analyze fish eggs collected on multiplates, to compare to egg TRVs; may be possible to compare egg TRVs to surface water concentrations	
12. Pre-breeding sturgeon whole body tissue	LWG assumes 100% presence and residence time for juveniles, but the largescale sucker and pikeminnow surrogates may not be appropriate. Currently, no whole body juvenile sturgeon data exist for the ISA; ISA-specific field collected tissue is needed to determine toxicity and bioaccumulation, and to inform the Food Web Model	Will use for assessing risk to sturgeon	individual whole body collection for the size of sturgeon that are known to reside in the ISA (juveniles)	
13. Estimates of reproductive sturgeon tissue concentrations	Long lived fish can accumulate higher levels of contaminants, and risk estimates for longer lived sturgeon are needed.	Will use for assessing risk to sturgeon	Modeling of tissue concentrations from pre-breeding tissue	
14. Need to analyze osprey eggs to understand contaminant concentrations	These data are needed to validate the Food Web Model and reduce uncertainty in assessing osprey risk using a sensitive reproductive endpoint.	Will use to validate the FWM and assess risk to osprey	Analysis of previously collected osprey eggs.	Osprey egg samples have been collected from the ISA by USGS. Opportunity to obtain and analyze data.
15. Evaluate and/or collect riparian soil and sediment data between the high water mark and the ordinary high water mark.	The bank system has not been characterized as part of the in-water RI/FS. This characterization needs to extend up to the Ordinary High Water Mark. Data are needed to assess risk to species that use the bank area as part of the aquatic system, including sandpiper/killdeer, mink/otter, amphibians, aquatic/emergent plants, invertebrates and fish	Will use to assess risk to in-water receptors	For aquatic/emergent plants, the LWG should assume that the plants are throughout the ISA, and focus data collection on any habitat areas that could support the plants.	A major gap currently exists in the LWG's efforts between Ordinary High Water Mark and the Low Water Mark.